

REMARKS

Claims 1, 3-13 and 15-16, 18-19 and 21-33 are pending. Claims 1 and 11 have been amended. Support for the amendments can be found throughout the specification, e.g., page 6, lines 12-13, and in the claims as originally filed. Claims 2, 14, 17 and 20 have been cancelled. No new matter has been added.

Rejection under 35 U.S.C. § 102(b)

The Examiner rejected claims 1, 3-9, 11, 13, 15, 16, 18, 19, 21-25, 27 and 29-33 under 35 U.S.C § 102(b) as being anticipated by U.S. Patent No. 5,547,748 to Ruoff et al. ("Ruoff") as evidenced by Valencia et al. "Understanding the stabilization of metal carbide endohedral fullerenes $M_2C_2@C_{82}$ and related systems," *J. Phys. Chem.*, 2008, 112, 4550-4555 ("Valencia") (see page 2 of the Office Action). Claims 1, 11, 21 and 27 are independent. Applicants respectfully disagree. Nevertheless, in an effort to expedite prosecution and not in acquiescence of the Examiner's rejection, Applicants have amended claims 1 and 11.

Each of claims 1, 11, 21 and 27 relates to a composition including a particle including a core and a shell, the core including a metal carbide and the shell including a carbon nanotube chemically attached to at least a portion of a surface of the core, wherein the metal carbide is silicon carbide.

Ruoff describes encapsulation of metal carbides inside multilayered polyhedral shells of carbon (nanoencapsulates), the resulting nanoencapsulate materials have uses as composite materials (see Ruoff, Abstract). Ruoff uses metal carbides such as gadolinium carbide, and does not mention silicon carbide. Ruoff does not describe composition including a particle including a core and a shell, the core including a metal carbide and the shell including a carbon nanotube chemically attached to at least a portion of a surface of the core, wherein the metal carbide is silicon carbide.

Accordingly, claims 1, 11, 21, 17 and any claims that depend therefrom are not anticipated by Ruoff. Applicants respectfully request reconsideration and withdrawal of the rejection.

Rejections under 35 U.S.C. § 103(a)

Ruoff in view of Ma

The Examiner rejected claims 2, 14, 17 and 20 under 35 U.S.C § 103(a) as being unpatentable over Ruoff in view of Ma et al., "Processing and properties of carbon nanotubes-nano-SiC ceramic," *Journal of Materials Science* 1998, 33, 5243-5246 ("Ma") (see page 3 of the Office Action). Claims 2, 14, 17 and 20 depend from independent claim 1.

As previously described, Ruoff does not teach or suggest the composition including a particle including a core and a shell, the core including a metal carbide and the shell including a carbon nanotube chemically attached to at least a portion of a surface of the core, wherein the metal carbide is silicon carbide. Ruoff describes the encapsulation of the metal carbides inside multilayered polyhedral shells of carbon (nanoencapsulates), the resulting nanoencapsulate materials have uses as composite materials (see Ruoff, Abstract). The nanoencapsulate is described as having "a polyhedral outer shell of nested, concentric layers of carbon, which defines an inner cavity or void. Encapsulated within this cavity is a metal" (see Ruoff, col. 2, lines 33-36). Ruoff describes the deposition of the carbonaceous material by the carbon arc process (see Ruoff, col. 10, lines 14-17). In the carbon arc process used described by Ruoff, "a carbonaceous deposit forms on one of the graphite rods, from which the nanoencapsulates are recovered. A soot is also produced during the process, and when the anode rod is drilled out and packed with Gd, Gd₂O₃ or Nd₂O₃, a new structure has been found in the soot" (see Ruoff, col. 10, lines 15-19). Here, as with the other descriptions of the carbon arc process described throughout Ruoff, the carbon structures are produced first, and then the metal deposits in the open structures in the carbon network.

The nanotubes described in the instant application are grown from the carbide particle directly by thermochemical means, with the carbide substrate and no other external source supplying the carbon, ensuring the true chemical bonding of the substrate and the nanotube surface layer (see specification, para. [0025]-[0028]). Indeed, in the process described by Ruoff, the order of addition of carbon and metal structures is the opposite of order in which materials are added in the process described in the instant application. The composition described by Ruoff, although made from similar material, differs from the claimed composition as in the present application since the process by which it is made is different.

Ma does not remedy these deficiencies. Ma describes dispersing nano-SiC powders and carbon nanotubes in butylalcohol using an ultrasonic shaker followed by hot-pressing (see Ma, Abstract). The process is a purely mechanical mixing of carbon nanotubes and SiC followed by hot-pressing. Ma makes no mention of a chemically bonded carbon nanotube covered carbide substrate. A person of ordinary skill in the art would understand that it would be impossible to modify the method disclosed by Ruoff to use the materials disclosed by Ma to form a composition including a particle including a core and a shell, the core including a metal carbide and the shell including a carbon nanotube chemically attached to at least a portion of a surface of the core, wherein the metal carbide is silicon carbide, as described in claim 1 of the instant application. As a result, the person of ordinary skill in the art would not be motivated to combine the references. Nor would the person of ordinary skill in the art have a reasonable expectation of success.

Applicants submit that the Examiner is relying on hindsight to reach this obviousness determination. The Federal Circuit has stated in W.L. Gore & Associates, Inc. v. Garlock, Inc., 220 USPQ 303 (Fed. Cir. 1983) that "[t]o imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, it to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher." *Id.*, at 312-13. It is essential that "the decisionmaker forget what he or she has been taught at trial about the claimed invention and cast the mind back to the time the invention was made...to occupy the mind of one skilled in the art who is presented only with references, and who is normally guided by the then-accepted wisdom in the art." *Id.*, at 313. The mere fact that references can be combined or modified does not render the resultant combination obvious unless the reference also suggests the desirability of the combination. See MPEP 2143.01 (citing *In re Mills*, 916 F.2d 680 (Fed. Cir. 1990)). In other words, it is legal error for the Examiner to use hindsight reconstruction to pick and choose among isolated disclosures in the cited references to deprecate the claimed invention.

Thus, neither Ruoff, Ma, nor their combination teaches or suggests all the elements of claim 1. Accordingly, claims 2, 14 and 20 are patentable over Ruoff in view of Ma. Applicants respectfully request reconsideration and withdrawal of this rejection.

Applicant : Yet-Ming Chiang et al.
Serial No. : 10/510,482
Filed : April 19, 2005
Page : 9 of 9

Attorney's Docket No.: 14952.0307 / MIT Case 8895

Ruoff

The Examiner rejected claims 10, 12 and 26 under 35 U.S.C § 103(a) as being unpatentable over Ruoff (see page 4 of the Office Action). Claims 10, 12 and 26 depend from independent claim 1 or 11.

As discussed above, Ruoff does not teach or suggest all elements of claim 1 or claim 11. Ruoff does not teach or suggest the composition including a particle including a core and a shell, the core including a metal carbide and the shell including a carbon nanotube chemically attached to at least a portion of a surface of the core, wherein the metal carbide is silicon carbide (see claims 1 and 11).

Thus, Ruoff does not teach or suggest all elements of claims 10, 12 and 26. Accordingly claims 10, 12 and 26 are patentable over Ruoff. Applicants respectfully request reconsideration and withdrawal of this rejection.

CONCLUSION

Applicants ask that the claims be allowed. Should any fees be required by the present Reply, the Commissioner is hereby authorized to charge Deposit Account 19-4293.

Respectfully submitted,

Date: 5-20-07



Harold H. Fox
Reg. No. 41,498

Customer No.: 27890
STEPTOE & JOHNSON LLP
1330 Connecticut Avenue, NW
Washington, DC 20036-1795
Phone: 202-429-3000
Fax: 202-429-3902